Electronic Version
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Claims

[c1] 1. A belt tensioning device for a belt drive having at least two belt pulleys and a continuous belt, the belt tensioning device comprising:
a torsion spring assembly with a longitudinal axis (A_2) and at least one torsion bar or torsion tube, the torsion spring assembly being adapted to be clamped axially and in a rotationally fast way into a rack;
a tensioning arm which, at one end, is arranged at the torsion spring assembly so as to be aligned approximately radially relative to the longitudinal axis (A_2); and
a tensioning roller rotatably arranged at the other end of the tensioning arm, wherein an axis of rotation (A_1) of the tensioning roller extends substantially parallel relative to the longitudinal axis (A_2) of the torsion spring assembly and wherein the tensioning arm can be resiliently supported relative to the rack so as to oscillate around the longitudinal axis (A_2).

[c2] 2. A device according to claim 1, wherein the torsion spring assembly comprises a plurality of individual torsion bars which, by being clamped together at their ends, form a bundle and are in line contact or surface

contact with one another.

[c3] 3. A device according to claim 1 comprising a damping unit articulated at the tensioning arm and supported at the rack.

[c4] 4. A device according to claim 2, wherein the bundle of torsion bars is clamped in at a first end of the torsion spring assembly in a fixing bush.

[c5] 5. A device according to claim 4, wherein the bundle of torsion bars is clamped in at a second end of the torsion spring assembly in another bush which is connected in a rotationally fast way to the one end of the tensioning arm.

[c6] 6. A device according to claim 2, wherein the bundle of torsion bars is enclosed by a tube which, at its two ends, is connected in a rotationally fast way to the two ends of the bundle of torsion bars and forms a rotary tube spring extending in parallel to the bundle of torsion bars.

[c7] 7. A device according to claim 2, wherein the bundle of torsion bars is enclosed by a tube which, at its one end, is connected in a rotationally fast way to one end of the bundle of torsion bars and which, at is other end, is freely rotatable relative to the bundle by a limited angular amount and, thereafter, abuts against the bundle and

forms a rotary tube spring which can be sequentially added to the bundle of torsion bars.

[c8] 8. A device according to claim 2, wherein the bundle of torsion bars is enclosed by a tube which, at its one end, is connected in a rotationally fast way to one end of the bundle of torsion bars and which, at its other end, is rotatable under friction relative to the other end of the bundle and forms a friction damping element connected in parallel to the bundle of torsion bars.

[c9] 9. A belt tensioning device for a belt drive having at least two belt pulleys and a continuous belt, the device comprising:
a torsion spring assembly with a longitudinal axis (A_2) and at least one torsion bar or torsion tube, the torsion spring assembly being adapted to be supported axially and radially in a rack;
first and second tensioning arms which, at their respective one ends, are arranged at the torsion spring assembly so as to be aligned approximately radially relative to the longitudinal axis (A_2); and
first and second tensioning rollers rotatably arranged at the respective other ends of the first and second tensioning arms, wherein axes of rotation (A_1, A_3) of the first and second tensioning rollers extend substantially parallel to the longitudinal axis (A_2) of the torsion spring

assembly and wherein the first and second tensioning arms are resiliently supported relative to the rack or relative to one another so as to oscillate around the longitudinal axis (A_2).

[c10] 10. A device according to claim 9, wherein that the torsion spring assembly comprises a plurality of individual torsion bars which, by being clamped together at their ends, form a bundle and are in line contact or surface contact with one another.

[c11] 11. A device according to claim 9 comprising, at at least one of the first or second tensioning arms, a damping unit adapted to be supported in the rack.

[c12] 12. A device according to claim 9, wherein the torsion spring assembly comprises a torsion spring unit and can be rotatably resiliently supported in the rack and, wherein the first tensioning arm is functionally connected to the one end of the torsion spring unit and the second tensioning arm is functionally connected to the other end of the torsion spring unit.

[c13] 13. A device according to claim 9, wherein the torsion spring assembly comprises two torsion spring units and can be clamped into the rack in a rotationally fast way, and wherein the first tensioning arm is functionally con-

nected to the first torsion spring unit and the second tensioning arm is functionally connected to the second torsion spring unit.

[c14] 14. A device according to claim 10, wherein the bundle of torsion bars is clamped in at a first end of the torsion spring assembly in a fixing bush.

[c15] 15. A device according to claim 14, wherein the bundle of torsion bars is clamped in at a second end of the torsion spring assembly in another bush which is connected in a rotationally fast way to a first end of the first tensioning arm.

[c16] 16. A device according to claim 14, wherein the bundle of torsion bars is enclosed by a tube which, at its first end, is connected in a rotationally fast way to the fixing bush and which, at its other end, is connected in a rotationally fast way to the second tensioning arm.

[c17] 17. A device according to claim 9 comprising friction damping elements arranged between the first tensioning arm and the second tensioning arm.

[c18] 18. A belt tensioning device for a belt drive having at least two belt pulleys and a continuous belt, the device comprising:
a torsion spring assembly with a longitudinal axis (A_2)

and at least one torsion bar, the torsion spring assembly being adapted to be clamped axially and in a rotationally fast way into a rack;

a tensioning arm which, at a first end, is arranged at the torsion spring assembly so as to be aligned approximately radially relative to the longitudinal axis (A_2); and

a tensioning roller rotatably arranged at a second end of the tensioning arm, wherein an axis of rotation (A_1) of the tensioning roller extends substantially parallel to the longitudinal axis (A_2) of the torsion spring assembly and wherein the tensioning arm is resiliently supported relative to the rack so as to oscillate around the longitudinal axis (A_2), and

wherein the at least one torsion bar is enclosed by a tube in whose end arranged opposite the tensioning arm, there is secured in a rotationally fast way the respective end of the at least one torsion bar, and in whose other end the tensioning arm is supported in a radial bearing, wherein the tensioning arm is connected in a rotationally fast way to the other end of the at least one torsion bar and wherein a central plane of movement (E) of the tensioning roller is positioned in the central region of said radial bearing.

[c19] 19. A device according to claim 18, wherein the torsion spring assembly comprises a plurality of individual tor-

sion bars which, by being clamped together at their ends, form a bundle and are in line or surface contact with one another.

[c20] 20. A device according to claim 19, wherein the bundle of torsion bars is clamped in at a fist end of the torsion spring assembly in a first bush which is firmly connected to the tube.

[c21] 21. A device according to claim 20, wherein the bundle of torsion bars is clamped in at a second end of the torsion spring assembly in a second bush which is connected in a rotationally fast way to the first end of the tensioning arm and is rotatably supported relative to the tube.

[c22] 22. A device according to claim 18, wherein the tube can be clamped directly into the rack or bolted on at the rack.

[c23] 23. A device according to claim 22, wherein the tube can be clamped in or bolted on in the vicinity of the plane of movement (E) of the tensioning roller.

[c24] 24. A device according to claim 18, wherein the tube is affixed in several locations along its length.

[c25] 25. A device according to claim 18, wherein the tension-

ing arm comprises two halves whose dividing plane corresponds approximately to the central plane of movement (E) of the tensioning roller and which each form a bearing region for the tensioning roller.

[c26] 26. A device according to claim 18 comprising a friction damping element between the tensioning arm and the tube.

[c27] 27. A device according to claim 26, wherein the friction damping element is arranged outside or inside the tube.

[c28] 28. A belt tensioning device for a belt drive having at least two belt pulleys and a continuous belt, the device comprising:
a torsion spring assembly with a longitudinal axis (A_2) and at least one torsion bar, the torsion spring assembly adapted to be supported axially and radially in a rack;
first and second tensioning arms which, at their respective one ends, are arranged at the torsion spring assembly so as to be aligned approximately radially relative to the longitudinal axis (A_2); and
first and second tensioning rollers which are rotatably arranged at the respective other ends of the first and second tensioning arms, wherein axes of rotation (A_1, A_3) of the first and second tensioning rollers extend substantially parallel to the longitudinal axis (A_2) of the tor-

sion spring assembly and wherein the first and second tensioning arms are resiliently supported around the longitudinal axis (A_2) so as to oscillate relative to one another, and

wherein the at least one torsion bar is enclosed by a tube in whose first end opposed to the first and second tensioning arms there is secured in a rotationally fast way the respective end of the at least one torsion bar, and on whose second end there is secured in a rotationally fast way the second tensioning arm, and wherein the first tensioning arm is supported in a radial bearing and is connected in a rotationally fast way to the other end of the at least one torsion bar, and wherein the central plane of movement (E) of the first and second tensioning rollers is positioned in a central region (A) of said radial bearing.

[c29] 29. A device according to claim 28, wherein the torsion spring assembly comprises a plurality of individual torsion bars which, by being tensioned together at their ends, form a bundle and are in line contact or surface contact with one another.

[c30] 30. A device according to claim 29, wherein the bundle of torsion bars is clamped in at a first end of the torsion spring assembly in a first bush which is firmly connected to the tube.

[c31] 31. A device according to claim 30, wherein the bundle of torsion bars is clamped in at a second end of the torsion spring assembly in a second bush which is connected in a rotationally fast way to a first end of the first tensioning arm and is rotatably supported relative to the tube.

[c32] 32. A device according to claim 28 comprising friction damping elements between the first tensioning arm and the second tensioning arm.

[c33] 33. A device according to claim 28, wherein the tube is rotatably supported in a sleeve which can be fixed to the rack.

[c34] 34. A device according to claim 33, wherein the sleeve can be fixed near the central plane of movement (E) of the first and second tensioning rollers.

[c35] 35. A device according to claim 33, wherein the sleeve is fixed in several locations along its length.

[c36] 36. A device according to claim 28, wherein the second tensioning arm is embraced yoke-like by the first tensioning arm.

[c37] 37. A device according to claim 28, wherein at least one of the first and second tensioning arms comprises two

halves whose dividing plane corresponds approximately to the central plane of movement (E) of the first and second tensioning rollers and which each form a bearing region for the first and second tensioning rollers.

[c38] 38. A belt tensioning device for a belt drive having at least two belt pulleys and a continuous belt, the device comprising:

first and second torsion spring assemblies with respective longitudinal axes (A_2, A_4) extending parallel relative to one another and each having at least one torsion bar or torsion tube which can be supported axially and radially in a rack;

first and second respective tensioning arms which each, at one end, are aligned approximately radially relative to the longitudinal axes (A_2, A_4) and arranged at the respective torsion spring assembly; and

first and second respective tensioning rollers each rotatably arranged at the respective other end of the tensioning arms, wherein axes of rotation (A_1, A_3) of the first and second tensioning rollers extend substantially parallel relative to the longitudinal axes (A_2, A_4) of the first and second torsion spring assemblies and wherein the first and second torsion spring assemblies are coupled to one another so as to be rotatable either in the same direction or in opposite directions.

[c39] 39. A device according to claim 38, wherein at least one of the first and second torsion spring assemblies comprises a plurality of individual torsion bars which, by being clamped together at their ends, from a bundle and are in line contact or surface contact with one another.

[c40] 40. A device according to claim 38 comprising a damping unit at at least one of the first and second tensioning arms which can be supported in the rack.

[c41] 41. A device according to claim 38 wherein the first and second torsion spring assemblies are coupled to one another by a two-arm crank rocker.

[c42] 42. A device according to claim 38, wherein the first and second torsion spring assemblies are coupled to one another by a spur gear drive.

[c43] 43. A device according to claim 39, wherein the bundle of torsion bars is clamped in at a first end of the respective torsion spring assembly in a first bush.

[c44] 44. A device according to claim 43, wherein the bundle of torsion bars is clamped in at a second end of the respective torsion spring assembly in a second bush which is connected in a rotationally fast way to one end of one of the tensioning arms.

[c45] 45. A device according to claim 39, wherein the bundle of torsion bars is enclosed by a tube which, at its two ends, is connected in a rotationally fast way to the two ends of the bundle of torsion bars and forms a rotary tube spring connected in parallel to the bundle of torsion bars.

[c46] 46. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 1, wherein the torsion spring assembly is clamped in axially and in a rotationally fast way in a rack.

[c47] 47. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 21, wherein the torsion spring assembly is clamped in axially and in a rotationally fast way in a rack.

[c48] 48. A belt drive according to claim 46, wherein in a nominal position, the tensioning arm extends approximately parallel relative to the connection between the axes of rotation of two belt pulleys across which there extends slack strand.

[c49] 49. A belt drive according to claim 47, wherein in a nominal position, the tensioning arm extends approximately parallel relative to the connection between the axes of rotation of two belt pulleys across which there

extends slack strand.

[c50] 50. A belt drive according to claim 46, wherein the tensioning arm is supported relative to the rack by a spring unit.

[c51] 51. A belt drive according to claim 47, wherein the tensioning arm is supported relative to the rack by a spring unit.

[c52] 52. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 10, wherein the torsion spring assembly is rotatably supported in a rack and wherein the fist tensioning arm is functionally connected to one end of a torsion spring unit and the second tensioning arm is functionally connected to the other end of the torsion spring unit.

[c53] 53. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 29, wherein the torsion spring assembly is rotatably supported in a rack and wherein the fist tensioning arm is functionally connected to one end of a torsion spring unit and the second tensioning arm is functionally connected to the other end of the torsion spring unit.

[c54] 54. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according

to claim 10, wherein the torsion spring assembly is clamped in a rotationally fast way into a rack and wherein the fist tensioning arm is functionally connected to a first torsion spring unit and wherein the second tensioning arm is functionally connected to a second torsion spring unit.

[c55] 55. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 29, wherein the torsion spring assembly is clamped in a rotationally fast way into a rack and wherein the fist tensioning arm is functionally connected to a first torsion spring unit and wherein the second tensioning arm is functionally connected to a second torsion spring unit.

[c56] 56. A belt drive according to claim 52, wherein at least one of the tensioning arms is spring-suspended relative to the rack by a spring unit.

[c57] 57. A belt drive according to claim 53, wherein at least one of the tensioning arms is spring-suspended relative to the rack by a spring unit.

[c58] 58. A belt drive comprising at least two belt pulleys, a continuous belt, and a belt tensioning device according to claim 38, wherein the first and second torsion spring

assemblies are rotatably supported in a rack and are connected to one another so as to be rotatable either in the same direction or in opposite directions.

[c59] 59. A belt drive according to claim 58, wherein at least one of the tensioning arms is supported relative to the rack by a friction unit or damping unit.

[c60] 60. A belt drive according to claim 58, wherein at least one of the tensioning arms is spring-suspended relative to the rack by a spring unit.